

Integrating biophilic design approach to sports architecture Case study of leadcity University Football Academy

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ARTICLE INFO	ABSTRACT
<i>Article history:</i> Received January 01, 2026 Received in revised form Feb. 18, 2026 Accepted May 12, 2026 Available online June 01, 2026 <i>Keywords:</i> Biophilic design Ecological integration Football academy Sport architecture *Corresponding author: Khaleedah Bolatito Jolaoso Department of Architecture, Bells University of Technology, Ota, Ogun State, Nigeria Email: khaleedahjolaoso@gmail.com ORCID: https://orcid.org/0009-0001-3281-301X	<i>The integration of biophilic design principles in sports architecture is rooted in the theory of biophilia and human innate affinity for nature, offering a compelling architectural football academy solution for better performance. This architectural approach seeks to strategically connect buildings, spaces and users more closely to nature, creating a productive, healthy and sustainable communal built environment. The study aims to investigate how integration of biophilic strategies can improve environmental sustainability, user well-being, and functional spatial performance in athletic facilities. Key objectives include identifying existing biophilic design elements, evaluating their impact, and proposing a context-specific framework for improvement. A qualitative methodology was adopted, incorporating site observation, architectural assessment, literature review and case study. Findings reveal partial implementation of biophilic features such as natural lighting, ventilation, and so on, while highlighting gaps in user-centred planning and ecological integration. The study also examines the integration of sustainable biophilic design principles in Leadcity University Football Academy in Oyo State, Nigeria and concludes that a comprehensive, nature-integrated approach can significantly improve athlete experience and environmental outcomes. The study recommends a biophilic design approach tailored to Nigerian sports facilities and policy reforms to incorporate biophilic design principles into national architectural guidelines for sports infrastructure.</i>

Introduction

Football is more than a game in Nigeria, and the most popular game in the world, promoting physical and mental health as well as national recognition (Nubi 2000). Culturally, football unites diverse ethnic, religious, and socio-economic groups, serving as a symbol of national pride and youth football development (Akbar, Karim, and Zakaria 2024). This shared enthusiasm has brought about the rise of football academies across the country, although still lacking the integration of practical programs and grassroots of football academies, that play a

critical role in fostering athletic talent, academic development, and community engagement (Akbar, Karim, and Zakaria 2024), thus creating career pathways not only for aspiring players but also in allied fields such as coaching, sports management, and education.

According to Akbar, Karim, and Zakaria (2024), previous studies indicated that to optimise player's performance, a successful football academy integrates human-centred design for mental conditioning. In response, architecture must adopt more responsive, sustainable, and human-centred design approaches to support both environmental and user needs.



Biophilic design, is an approach as a whole, creating environments that emphasise on human well-being (Marques and McIntosh 2025), contribute to the overall sustainability and resilience of the built environment while reducing the impacts environmentally by nurturing both individual and the planet (Andreucci et al. 2021). Biophilic design is regarded as a design guide to meet the need for nature in buildings by incorporating the theory of biophilia to sustainability (Kellert 2018), city and landscape planning and architecture as a whole (PAUL AGBOOLA 2025). Given this fact stated by Kellert (2018), that connections between humans and their surroundings result in environmental impact, biophilic design principles can be incorporated in various building typologies (Barrett et al. 2013), including football academy to create an environmentally responsive and sustainable architecture thus, ensuring biophilic architecture as an architectural approach that seeks to strategically connect building(s), space(s), spatial requirement and users functionally and closely to nature towards creating a productive, healthy, safe, conducive and communal built environment.

The study therefore, aims to explore how biophilic design approaches can be integrated into the architecture of football academies to enhance user well-being, environmental performance, and spatial quality in Nigeria, using Leadcity University as a case study, located in Ibadan, Oyo State, serving as a relevant case study due to its growing academic-athletic framework and its potential to serve as a replicable model. Globally, football academy infrastructure has shifted from solely utilitarian designs toward environments that promote athlete well-being and sustainable performance. This evolution is evident in site planning, orientation, spatial organization, and material selection, all of which aim to support physical performance, recovery, and environmental stewardship (Petersen and Judge 2023). Site selection criteria now emphasize minimal environmental disruption, access to green views, and integration of natural topography and features (Nusri et al. 2024). Orientation and circulation strategies are increasingly being optimized to mitigate sun glare, encourage passive cooling, and improve user experience (Travassos, Ribeiro, and Gomes 2025). As a private institution, Leadcity University provides a controlled environment with structured programs that allow for

assessment and observation of spatial and environmental design. Furthermore, Oyo State reflects a typical urban setting faced with both infrastructural and climatic challenges making the case study applicable to many other regions across Nigeria (Ayoko, Peter, and Jegede 2023).

The study is significant for its contribution to knowledge on sustainable sports architecture in developing region while addressing response to both local and global demands for environmentally responsible and user-centered design, aligning with the United Nations Sustainable Development Goals, particularly SDG 3 (Good Health and Well-being) and SDG 11 (Sustainable Cities and Communities). By exploring the relationship between biophilic design and performance in sports settings, the study seeks to inform future policies and design frameworks that can improve academy environments across Nigeria. The study would identify and examine the transformative potential of biophilic design in sports architecture and its relevance for Nigeria's evolving educational and athletic infrastructure.

Methods

Biophilic design integrates natural elements into built environments to promote health and well-being and has gained traction in sports architecture (Grazuleviciute-Vileniske, Daugelaite, and Viliunas 2022; Kellert, Heerwagen, and Mador 2011). Elsafty (2024), outline three biophilic strategies as: (1) nature incorporation (e.g., daylight, vegetation, water, and so on); (2) nature inspiration; and (3) nature interaction (prospect, refuge, complexity, and so on). These strategies collectively foster restorative, engaging environments for athletes and spectators.

Nature incorporation provides physiological and psychological benefits such as relaxation and enhanced concentration (Browning and Ryan 2020). For instance, Sadick and Kamardeen (2020); Zhong, Schröder, and Bekkering (2022), found that incorporating biophilic design strategies in workplaces improves employees' cognitive recovery, stress management, health outcomes, management, and overall well-being, while studies by Peters and D'Penna (2020); Ghaziani, Lemon, and Atmodiwirjo (2021); Zhong, Schroeder, and Bekkering (2023) found

that nature-inspired design in educational settings promotes better stress control and cognitive performance. These studies demonstrated the diverse benefits of biophilic design as a cost-effective means of restoring nature interactions that resulted in declined health and well-being caused by increased urbanisation.

In Nigeria, Akbar, Karim, and Zakaria (2024), most Nigerian football academies do not incorporate environmental or user-centred design strategies, resulting in spaces that may hinder rather than enhance athlete development. Petersen and Judge (2023) further assert that emphasis is placed primarily on pitch quality, with minimal attention to holistic environments conducive to mental and physical recovery. While drawing insights from international best practices, the research emphasises the importance of local adaptation, both in design application and in policy direction. This implies that there is the need to improve athlete performance and promote sustainability in Nigerian football academies, which somewhat presents biophilic integration as not only desirable but necessary.

A qualitative research approach was adopted, integrating literature reviews, site observations, and case study to extract data and elicit information. Data were gathered from Leadcity University and analysed with documentation and content analysis, thus focusing on the presence and adequacy of 24 biophilic design variables that are categorised under the nature incorporation; the nature inspiration; and nature interaction as indicated in table 1 in line with the view of Elsafty (2024).

Table 1. Biophilic design strategies and approaches

S/N	Strategies	Biophilic design approaches
1	Nature Incorporation	i. Light
		ii. Air
		iii. Water
		iv. Plants
		v. Animals
		vi. Weather
		vii. Natural Landscape and Ecosystem
2	Nature Incorporation	i. Fire
		ii. Image of Nature
		iii. Natural Materials
		iv. Natural Colors
		v. Stimulating Natural Light and Air
		vi. Naturalistic Shapes and Forms
		vii. Evoking Nature
		viii. Information Richness
		ix. Age, Change, and the Patina of Time

S/N	Strategies	Biophilic design approaches
3	Nature Incorporation	x. Natural Geometries
		xi. Biomimicry
		i. Prospect and Refuge
		ii. Organized Complexity
		iii. Integration of Parts to Wholes
		iv. Transitional Spaces
		v. Mobility and Wayfinding
		vi. Cultural and Ecological Attachment to Place

Source: Adapted from Elsafty (2024)

Results and discussion

The study revealed varied levels of biophilic integration across the case study facility:

1. Nature Incorporation such as daylight and air circulation were present but inconsistently optimized.
2. Nature Inspiration, including use of natural colors and materials, showed a moderate adoption, though often superficial or decor-based rather than systemic.
3. Nature Interaction, which includes elements like prospect/refuge, spatial transitions, and cultural identity, was the least adopted despite its potential impact on user comfort and cognition (Elsafty 2024).



Figure 1. Main Entrance of Leadcity University, Ibadan, Nigeria



Figure 2. The football pitch

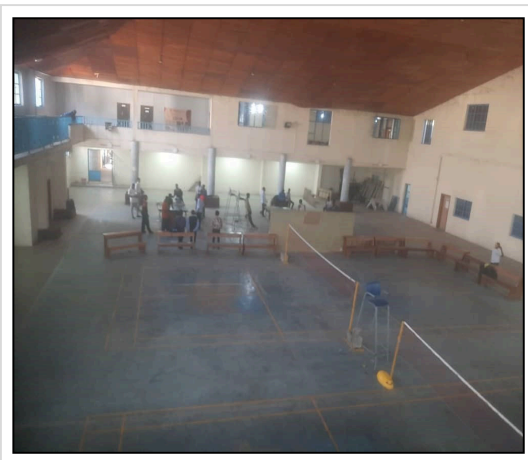


Figure 3. Indoor Tennis

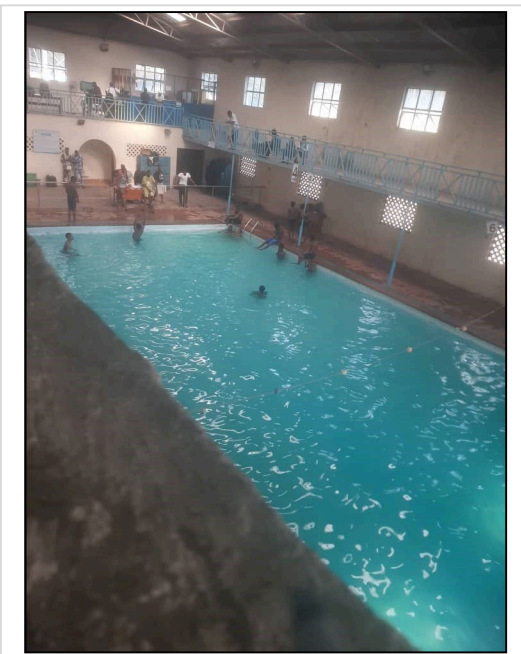


Figure 4. Indoor swimming pool

The table 2 below shows the level of availability and adequacy of the biophilic design approaches in the selected football academy following this pattern; Adequate (A), Available and Inadequate (AI), and Not Available (NA).

Table 2. Level of availability and adequacy of the biophilic design approaches in the selected football academy

S/ N	Strategies	Biophilic design approaches	A	A I	N A
1.	Nature Incorporati on	i. Light	✓		
		ii. Air	✓		
		iii. Water	✓		
		iv. Plants	✓		
		v. Animals		✓	
		vi. Weather	✓		
		vii. Natural Landscape and Ecosystem	✓		
2.	Nature Incorporati on	i. Fire			✓
		ii. Image of Nature	✓		
		iii. Natural Materials		✓	
		iv. Natural Colors		✓	
		v. Stimulating Natural Light and Air		✓	
		vi. Naturalistic Shapes and Forms		✓	
		vii. Evoking Nature		✓	
		viii. Information Richness		✓	
		ix. Age, Change, and the Patina of Time		✓	
		x. Natural Geometries			
		xi. Biomimicry			
3.	Nature Incorporati on	i. Prospect and Refugee		✓	
		ii. Organized Complexity	✓		
		iii. Integration of Parts to Wholes	✓		
		iv. Transitional Spaces	✓		
		v. Mobility and Wayfinding		✓	
		vi. Cultural and Ecological Attachment to Place	✓		

The most frequently implemented strategies were natural lighting, vegetation, and visual connections to nature. However, these were often inadequately planned, lacking functional synergy with site zoning, building orientation, or user flow. Notably, 12 biophilic strategies were rated

adequate, 11 were inadequately implemented, and 1 was absent entirely.

Conclusions

This study reveals the transformative potential of biophilic design in enhancing both the sustainability and functionality of football academies in Nigeria. Despite awareness of its benefits, practical application remains limited. A nature-integrated approach tailored to Nigeria's climatic, cultural, and economic realities can significantly enhance athlete performance, psychological well-being, and environmental outcomes.

Based on the findings of this study, the following recommendations are proposed to facilitate the effective integration of sustainable biophilic design in sports architecture across Nigeria, using the Leadcity University Football Academy as a case study: (1) Policy development and institutionalization through the establishment national and state-level architectural guidelines that mandate the integration of biophilic design principles in the planning, construction, and renovation of sports facilities; and integration of biophilic strategies into urban development frameworks and building codes through relevant government agencies such as the Federal Ministry of Works and Housing and the Architects Registration Council of Nigeria (ARCON); (2) Curricular integration in architectural and built environment programmes across the academic institutions by updating architecture and planning curricula in Nigerian universities to include sustainable biophilic design theory and application, particularly in sports and recreational facility design; and encouraging interdisciplinary collaboration between and amongst architecture, environmental science, public health, and sports management departments towards the promotion holistic design thinking; (3) Professional capacity building and awareness through workshops, seminars, and continuing professional development (CPD) programmes for architects, urban planners, facility managers, and construction professionals at enhancing their understanding and application of biophilic strategies; and by promoting awareness of the mental, physiological, and environmental benefits of biophilic design among stakeholders and decision-makers in the sports and education

sectors; (4) Pilot implementation at Leadcity University in Nigeria should initiate a phased biophilic design enhancement of its football academy, while incorporating features such as green roofing, shaded walkways, water elements, indoor plants, and natural ventilation systems. This can be deployed as pilot project to serve as a living laboratory and model case study for other institutions across Nigeria to emulate; (5) Incentive mechanisms and government support by providing financial incentives such as grants, tax reductions, or subsidies at encouraging private developers and educational institutions towards adopting biophilic and sustainable design in their sports architecture projects. Institutionalization of national awards in recognition of the deployment of outstanding biophilic design innovations in the sports infrastructure sector; (6) Develop a post-occupancy evaluation framework to assess the impact of biophilic design features on athletic performance, user satisfaction, and operational efficiency over time; and (7) Encourage further research into locally adaptive materials, plant species, and low-cost biophilic interventions suited to the Nigerian climate and cultural context.

By implementing these recommendations, it is expected that, Nigeria can foster an architectural paradigm shift toward human-centered, ecologically responsible sports infrastructure that promotes wellness, environmental stewardship, and sustainable development.

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Author(s) contribution

Khaleedah Bolatito Jolaoso contributed to the research concepts preparation, methodologies, investigations, data analysis, visualization, articles drafting and revisions.

Babatunde Adekoyejo Jolaoso contribute to the research concepts preparation and literature reviews, data analysis, of article drafts preparation and validation.

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